FROM THE

GREAT LAKES TO THE ATLANTIC.

THE MONTREAL, OTTAWA & GEORGIAN BAY CANAL COMPANY.

From Top of Ouiseau Rock, Looking Down Ottawa River Towards Pembroke,
(thirty-five miles distant.)

Montreal, Ottawa & Georgian Bay canal.

MEMORANDUM

On the GROWTH of the TRAFFIC on the GREAT LAKES AND THE PROPOSED OTTAWA SHIP NAVIGATION

WITH COMPLIMENTS OF THE

MONTREAL, OTTAWA & GEORGIAN BAY CANAL COMPANY

Head Office: OTTAWA, CANADA

MAY, 1901

CORRECTED.

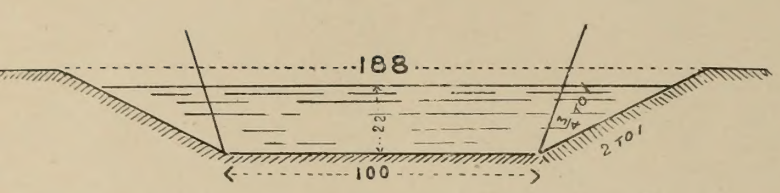
THE BENALLACK LITHO. & PRINT CO.
MONTREAL.

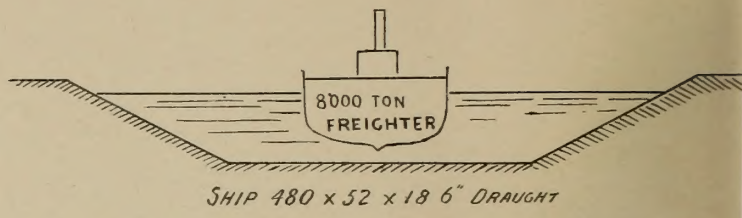
NOTE.

The authorities from which extracts and abstracts have been made are:—The United States Deep Waterways Commission's Report, 1897; The United States Board of Engineers Report, now being published; The Report of the New York Commerce Commission, 1900; The Report of Committee on Canals of New York State, 1899; The Chicago Board of Trade Report, 1900; The Proceedings of the American Society of Civil Engineers, 1900 and 1901; Papers by Mr. Joseph Mayer, M. Am. Soc. C. E. and Mr. George Y. Wisner, M. Am. Soc. C. E. and discussions thereon and the Annual Report of the Department of Railways and Canals.

CROSS-SECTIONS OF NOTED CHANNELS

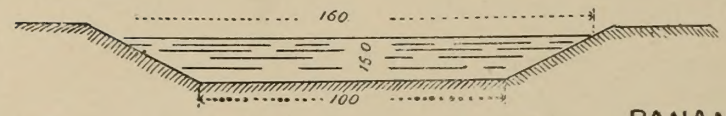
MONTREAL, OTTAWA & GEORGIAN BAY CANAL





SHIP 480 x 52 x 18 6" DRAUGHT

WELLAND & SOULANGES



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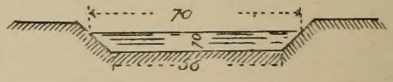

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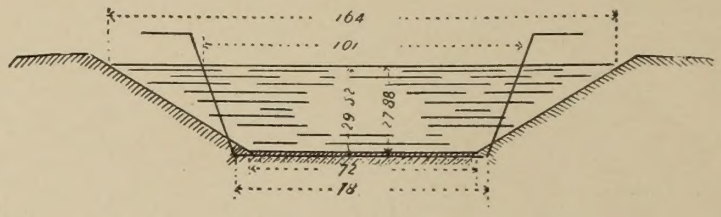

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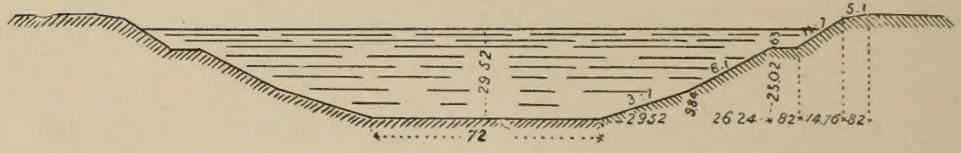
- BALTIC -



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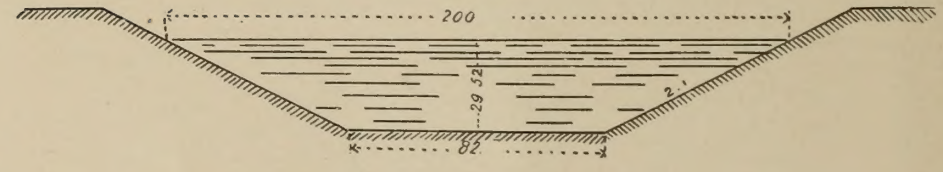
AMSTERDAM -



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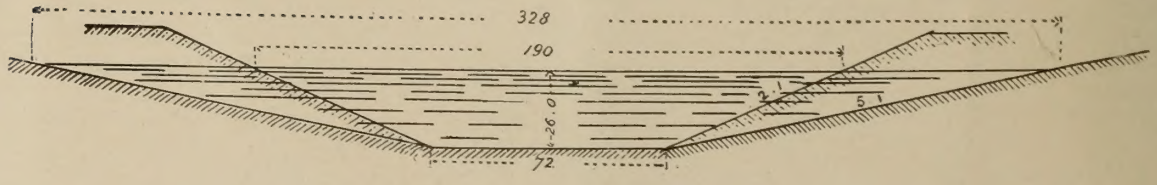

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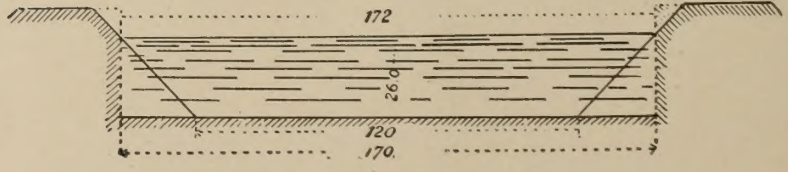


THE TRAFFIC ON THE GREAT LAKES AND THE PROPOSED OTTAWA SHIP NAVIGATION

FROM the time of the arrival of the first French explorers on the Great Lakes in the seventeenth century until the present, the utilization of the great waterways through these lakes as a means for the development of new commerce has been a prominent factor in the commercial and industrial progress of the country. It is only 200 years since the first sail vessel was launched on the Upper Lakes, during which time the birch bark canoe has been transformed into the steel freight steamship of 8,000 tons capacity, and a freight traffic of 40,000,000 tons annually has been developed from the natural resources of the country tributary to the lake system of waterways.

Without the facilities for easy transportation afforded by these waterways, the lake cities would never have reached their present importance, and without the commercial and manufacturing requirements of these cities the unprecedented growth of the lake commerce would not have occurred. The St. Lawrence River and the Hudson River are the natural gateways of commerce on the Atlantic coast, and to connect these with the Great Lakes by a waterway of suitable dimensions to economically transport the commerce of the country tributary to the lake system, has been the most important project for public improvements, claiming the attention of the governments of Canada and the United States, and has of late received the greatest attention from the latter.

Two general systems of canals have been constructed to secure through water navigation from the lakes to the Atlantic, one by the Canadian government, around the rapids and obstructions of the Niagara and St. Lawrence Rivers; the other by the State of New York from Lake Erie to the Hudson River at Albany. Both of these were inadequate for the demands of commerce when completed. The Canadian system has been enlarged three times, and the Erie Canal once, and the second enlargement commenced; and still, like a narrow-guage railroad, their dimensions are not such as to form a satisfactory and even approximately adequate link between the larger transportation routes which they connect. The possibilities for the growth of commerce were never sufficiently realized to warrant the construction of transportation routes on such broad principles as to anticipate the actual returns by the time that the work could be completed. No attempt apears to have been made to determine the channel dimensions which would ultimately be required to form a through transportation route from the lakes to the seaboard, without the necessity of transferring freight at intermediate ports.

The present depth of these waterways is not such as to meet the requirements of the modern economic lake freight carrier, and this can only be obtained by making the connecting waterway of dimensions to conform with the controlling depths of the lakes themselves.

On the lake waterways the improvement of depth has been a gradual one, and unlike the construction of existing canals, the money expended on such work has not been lost when considered in reference to future enlargements. When the Erie Canal was first opened, Thomas Jefferson declared that the project was a hundred years ahead of its time, yet within ten years afterwards it became necessary to commence enlargements which cost fully as much as though no work had been done.

The Welland Canal was opened in 1829, and the St. Lawrence navigation completed in 1847 for eight feet navigation. In 1871 it was decided to enlarge the canals of the St. Lawrence River system to afford a depth of 12 feet throughout, but before this could be completed the project was modified, and all the locks on the route made 45 feet wide and 14 feet deep on the sills. The locks of 270 feet in length are intended to pass lake steamers of 2,000 tons capacity. The completion of this system of waterways from Lake Erie to tide water does not, however, indicate that the causes which have produced the decline in water transportation between the lakes and the Atlantic have been overcome.

The St. Mary's River is the only waterway from Lake Superior to the Lower Lakes, and before improvement was obstructed in many places by boulders and rapids, the principal fall being at Sault St. Marie of 19 feet. In 1855 the first canal was constructed by the United States government, with a depth of 11 feet on the mitre sills.

It was recognized soon after its completion that the facilities afforded by the dimensions of the waterway were inadequate to accomodate the growing traffic of Lake Superior, and in 1870 the United States government commenced the improvement of the canal, comprising the deepening to 16 feet of the channels and the construction of a new lock having 16 feet on the mitre sills.

The commerce of Lake Superior reached such proportions in 1884 that a project for a larger lock with 21 feet of water on the sills was proposed and a lock 800 feet long, 100 feet wide and 21 feet deep was completed in 1896 ; the Canadian government having, in the meantime, constructed on their side a lock 900 feet long, 60 feet wide and 20 feet 3 inches deep, completed in 1895.

One of the most strongly marked features of recent navigation on the Great Lakes has been the steady increase in the size of ships. During the year ending June, 1883, there were registered at the Soo Canal 4384 passages of vessels with a net registered tonnage giving an average of 543 tons per passage. During the year 1891 the average was 862 tons per passage, and in 1899, 1146 tons, an increase of more than 100 per cent. in 17 years.

Allthough these figures show the rate of increase in registered tonnage they do not give an accurate idea of the character of that change. While it has been on the whole a continuous increase, it has been greatest when large additions were made to the navigable depth of the water in the channels connecting the lakes and the principal lake harbours. In 1870 freight through the canal was carried mainly in sailing vessels of 300 to 400 tons, net register, carrying cargoes of 600 to 700 tons on 11 feet of water, which was then the limiting depth. During the next eleven years the deepening of the connecting channel to 16 feet was in progress but was not available until the opening of the second Soo lock in 1881. This period was marked by the introduction of freight steamships each towing one to three sailing barges. The net register of these ships was in most cases less than a thousand tons, but a few were built of about 1500 tons. In anticipation of the opening of deeper waterways, the new ships were designed to draw 14 to 15 feet when fully loaded. With the opening of the lock in 1881, the building of small sailing vessels was checked and after four or five years, ceased almost entirely. The old ships became unprofitable and during seasons of low freight rates, were put out of commission. The building of a larger class of ships from 1700 to 1800 tons register was taken up and they carried a constantly increasing proportion of freight.

The Canadian lock was opened in 1895 and the Poe lock in 1896 with a depth of 20 to 21 feet on the sills. As in 1881 the increased draft had been to some extent anticipated by the building of ships which could not be fully loaded on a draft of 16 feet. Several exceeded 2,000 tons and a few 2,500 tons. These ships were designed to carry about twice the register but up to the end of, 1894 the maximum cargo was less than 3,800 tons, showing that the depth of water in the channels did not permit full

loading. During the next two years about thirty ships were built which slightly exceeded 3,000 tons net register, and with the improved condition of locks, and channels. the maximum cargo rose to 6,244 tons. In 1898 three ships of more than 4,000 tons register were in service with a maximum cargo of 7,840 tons; in 1899 the maximum cargo was 8,339 tons; one ship carried close on 10,000 tons in 1900.

The economy of transportation in these large ships has been so marked that the building of ships of less registered tonnage than 2,000 for through freight business from western lake ports to Lake Erie ports has practically ceased. The largest ships now in use on the lakes have a length of 500 feet over all, and a beam of about 52 feet. Considering how rapidly the cost of a ship increases with its length and how difficult it is to secure structural strength without increase of draft, it seems reasonable to conclude that no very marked further increase will take place. This ratio between length and draft has been lately very carefully considered by the British Institute of Naval Architects, and the cost of various lengths of ships estimated in proportion to the depth. This conclusively proves the greater cost of transportation in large ships per ton of cargo on a limited draft, and the economy of transportation in large ships with draft increasing with length. It has been shown that the most economical ships for a 20 foot draft would have a length of 480 feet and a breadth of 52 feet This analysis, therefore, supports the idea that the limit of size of lake boats has been reached unless the channels and the harbours are made deeper.

Canals of greater depth from the Great Lakes to the seaboard have been under the consideration of the United States government and the State of New York for many years past. The first survey for the same was made in 1835, for a canal 10 feet deep, and in 1853 for one 14 feet deep. The cost being considered excessive, a new project, in 1863, was put forward for a ship navigation of 12 feet. This was again put aside, and a new survey made in 1867 for one of 14 feet. In 1884 a new project was put forward for one of 18 feet, and this was again put aside and new surveys made in 1896, and a barge canal projected with a depth of 12 feet.

In 1895 the importance of this transportation question was so far realized that in February, 1895, a resolution passed the Senate and House of Representatives authorizing the President to appoint a Committee "To investigate and report whether it is feasible to build such canals as shall enable vessels engaged in ocean commerce to pass to and fro between the Great Lakes and the Atlantic Ocean, where such canal, can be most conveniently located, and the probable cost of the same."

This Deep Waterways Commission issued its report in January, 1897. It contains the following:—

"The most profound economic changes of modern times have been brought about by the improvements in transportation. The railroad of to-day bears about the same relation to the transportation of thirty years ago as that did to the stage-coach and freight-wagon of the first quarter of the century.

"In the first half of the century each nation practically depended upon its own agriculture for the subsistence of its people. States or communities isolated by distance or mountain ranges might suffer from famine. A bushel of wheat raised far west of the shore of Lake Superior and now consumed by cotton spinners in Lancashire, 5,000 miles away from the field of its growth, might have its value exhausted by a wagon haul of 100 miles. Now the combined stock of the world is the daily visible supply; its amount is known in every city, and its accessibility is fully understood.

"In 1869 occurred the opening of the Suez Canal, which brought the East into competition with western civilization by reducing a voyage of 6 to 8 months to 30 days, making it necessary to readjust ancient systems of distribution. A part of the effect of this rearrangement of the world's commerce upon the business of this country may be seen in the reductions of the freights upon grain about 75 per cent. The magni-

LAKE ONE, FROM NEAR LOWER END, LOOKING TOWARDS TROUT LAKE,
(Summit Section.)

MONTREAL, OTTAWA & GEORGIAN BAY CANAL.

tude of commercial change or disturbance in reduction of value may be estimated from the fact that five years after the opening, the trade of India with foreign countries had so increased in volume as to employ an increase of 250,000 tons of steam shipping, an equivalent of 500,000 tons of sail.

"The limit of reduction in railroad freights seems to have been reached; it remains to be determined if it is not possible to extend lake navigation to the ocean by a practicable ship canal. Although the development of our natural waterways is but little advanced beyond the bounty of nature, and is capable of immediate and vast extension, the effect of the little we have done has been enormously profitable.

"The chain of Great Lakes with a water surface of 95,965 square miles, gives us a deep freshwater navigation, the extent of which can not be accurately stated, so rapidly does it increase. If it is overestimated in enthusiastic estimate, the calm statistics soon overtake the exaggeration.

"At Buffalo bulk has to be broken, the grain elevated and transferred to cars or canal boats and the same thing, with equal expenses, is repeated at New York. The lake freight from the farthest shore of Lake Superior and of Lake Michigan to Buffalo is from 1 to 1½ cents a bushel ; the ocean freight from seaboard to Europe, 3 cents. The whole cost, however, from Chicago or Duluth to Europe is from 9 to 10 cents. Therefore, more than half the cost goes to railway or canal freights, commissions and elevator charges, to which must be added the item of waste. It costs twice as much to carry a barrel of flour from Duluth to New York as it does from New York to Europe, though the latter distance is twice as great as the former".

The Commission urged the appointment of a technical board of engineers to investigate their conclusions and the probable cost of the ship canal to New York recommended by them. This Board was designated and appointed by the President of the United States and consisted of the well known Civil Engineers Mr. Alfred Noble of Chicago and Mr. Geo. Y. Wisner of Detroit, and Major Charles W. Raymond, Corps of Engineers U. S. Army. They met in August, 1897, and have gone into the question of ship canals and lake transportation most thoroughly for the last three years. The office was at Detroit, under the immediate personal supervision of Mr. Wisner and he has given close and continuous attention to the work of the Board throughout the whole period of its operation.

They were asked to compare the cost and relative advantages of a 21 foot waterway and one of 30 feet which would allow of the largest ocean steamers entering the lakes. Their recommendation is :

For depths of over 21 feet the interest on the cost of construction exceeds the decrease in transportation rates, due to the use of deeper draft carriers, and that the 21 foot waterway promises a much greater return of value relatively to its cost than a 30 foot waterway which would allow of the entrance to the lakes of large ocean going steamers.

The foregoing considerations and the conclusions arrived at after such careful investigation and study demonstrate conclusively the necessity of a ship canal from the Great Lakes to the seaboard and fixes the required depth of such a canal not only for the present, but also for the future.

We now propose to consider the actual existing Traffic and its bearing on the proposed Ottawa River Navigation.

1
The Trade.

THE area of the industrial and agricultural district affected by the transportation system of the Great Lakes is that stretch of country having its apex at Chicago and St. Louis and stretching back to the West and Northwest and comprising the states of Missouri, Illinois, Kansas, Nebraska, Iowa, Wisconsin, Minnesota, the Dakotas, and the province of Manitoba, Ontario and the Canadian Northwest.

This country has an area of over 2,000,000 square miles.

It has a population of over 21,000,000 and five years ago had only 17,000,000. It is the finest grain-growing country in the world and produced in 1899,—2,223,000,000 bushels of Wheat, Barley, Oats, Corn and Rye. It is the export traffic of a portion of this grain, together with the movement of iron ore, that has given the impulse to lake shipping which has brought it to its present magnitude and perfection of economical transportation.

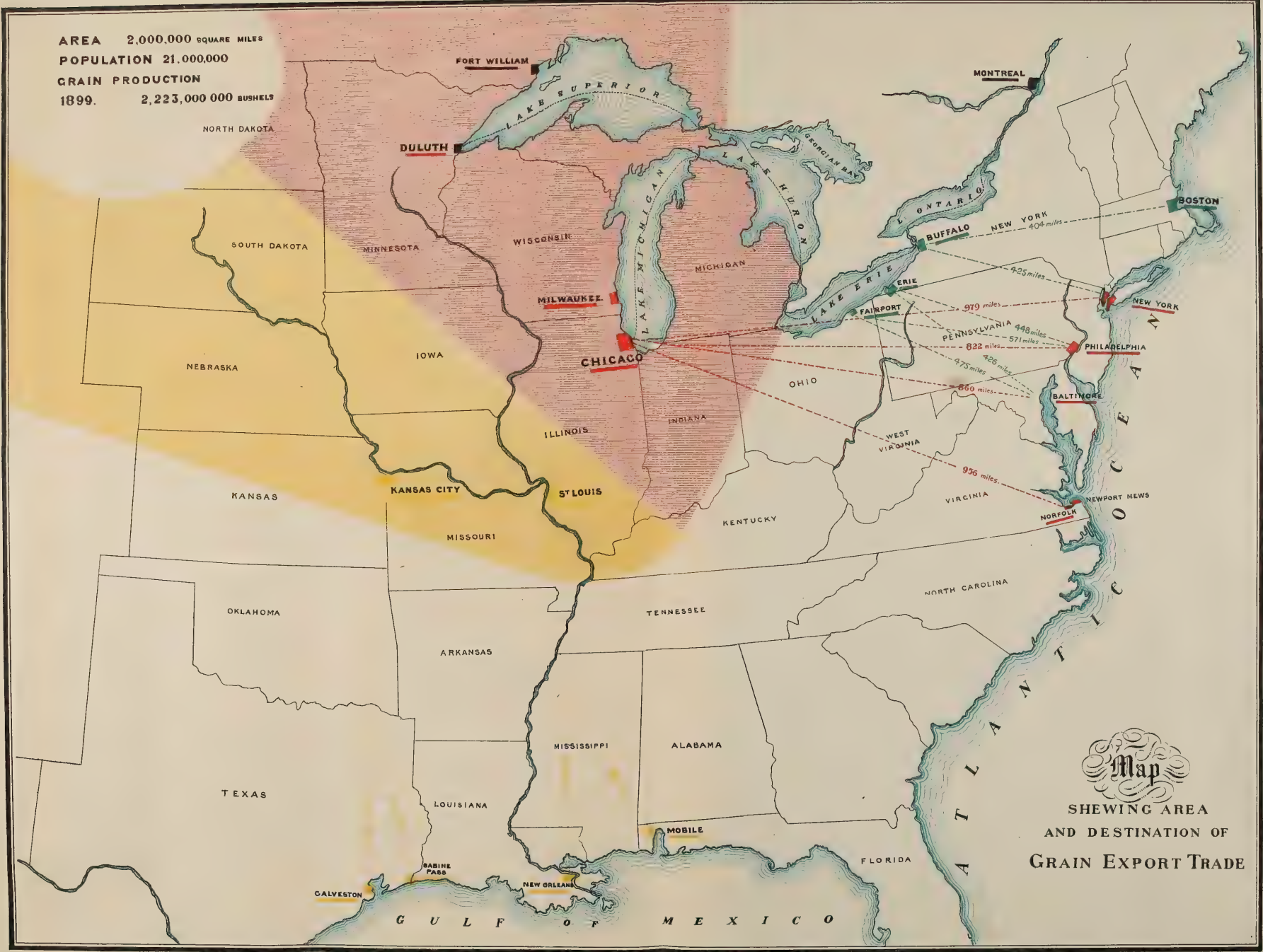
A glance at the map will show the present position of this trade. The points of assemblage for this enormous traffic are, on the one hand, Kansas City and St. Louis; on the other, Chicago and Milwaukee and Duluth. In these centres the grain is sorted, cleaned and classified and prepared for shipment. And from these centres respectively they are sent either *South*, to the Gulf ports of Galveston, Sabine Pass, New Orleans, Mobile and Pensacola; or *East*, to Norfolk, Newport News, Baltimore, Philadelphia, New York and Boston, a small portion going out by way of Montreal.

This is the case in spite of considerable variations in the distances as shewn below, and is due to the railway combinations and pools:

Kansas City	to Galveston,	905	Miles.
" "	to Sabine Pass,	985	"
St. Louis	to New Orleans,	706	"
"	to Mobile,	847	"
Chicago	to Newport News,	966	"
"	to Philadelphia,	822	"
"	to Baltimore,	860	"
"	to New York,	979	"
Buffalo	to Boston,	494	"
"	to New York,	409	"
		424	"
		439	"
Erie	to Philadelphia,	446	"
"	to Baltimore,	426	"
Fairport	to "	475	"

2
What governs Rates?

What absolutely governs the tendency either *East* or *South* is the all-rail rate from Chicago to the Eastern ports and from St. Louis and Kansas City to the Southern ports. It is these two channels that practically divide this trade, whose rate is governed by the railways, and a dribble of about 8 per cent. or less passes out through Montreal and the St. Lawrence. That the all-rail rate fixes the direction of the traffic is proved by the fact that when the Lakes' traffic is stopped during winter the grain rate from these centres to the seaboard is only slightly increased. The contest between the Gulf roads and Atlantic roads going on just the same, the latter however losing the advantage of the partial lake route, Chicago to Buffalo.


AREA 2,000,000 SQUARE MILES
POPULATION 21,000,000
GRAIN PRODUCTION
1899. 2,223,000 000 BUSHELS
FORT WILLIAM
LAKE SUPERIOR
DULUTH
NORTH DAKOTA
SOUTH DAKOTA
MINNESOTA
WISCONSIN
MILWAUKEE
LAKE MICHIGAN
MICHIGAN
GEORGIAN BAY
LAKE HURON
CHICAGO
NEBRASKA
IOWA
ILLINOIS
INDIANA
OHIO
KANSAS
KANSAS CITY
ST LOUIS
MISSOURI
KENTUCKY
WEST VIRGINIA
VIRGINIA
NEWPORT NEWS
NORFOLK
BALTIMORE
OKLAHOMA
ARKANSAS
TENNESSEE
NORTH CAROLINA
MISSISSIPPI
ALABAMA
TEXAS
LOUISIANA
MOBILE
FLORIDA
SABINE PASS
GALVESTON
NEW ORLEANS
GULF OF MEXICO
ATLANTIC OCEAN
MONTREAL
LAKE ONTARIO
BOSTON
BUFFALO
NEW YORK
404 miles
425 miles
ERIE
LAKE ERIE
FAIRPORT
979 miles
NEW YORK
PENNSYLVANIA
448 miles
571 miles
822 miles
PHILADELPHIA
426 miles
475 miles
660 miles
956 miles
Map
SHEWING AREA
AND DESTINATION OF
GRAIN EXPORT TRADE

The competition is so keen that rates are cut down to their lowest limit, the tug-of-war being between the Atlantic ports and the Gulf ports. A leading Chicago firm writes: "The business is worked so fine on account of this extreme competition between the Gulf roads and the roads running East, and between the grain dealers at Kansas City and St. Louis, and the grain dealers at Chicago, Milwaukee and other Lake ports, that oftentimes the difference of ⅛ cent per bushel will swing the business from Nebraska or Kansas locality either to Chicago and *East* via the Great Lakes and Buffalo to Atlantic ports or *South* to the Gulf of Mexico to be exported from Galveston, New Orleans or other Gulf ports."

Before the New York Commerce Commission, which reported last year, it was clearly demonstrated how the trade of Atlantic ports was diverted to the Gulf roads by a very small difference in all-rail rates. Mr. Harriett, the General Traffic Manager of the Erie Railroad, disclosed in his testimony that "when the rate to the Southern Atlantic ports (Norfolk and Newport News) was slightly raised, the diversion of grain to the Gulf ports immediately became so marked that as a result, within a month, the Southern Atlantic railroads demanded and secured a reduction of rates. If, by slightly raising their rate, the more expensive routes through the Southern Atlantic ports lose business to the Gulf it emphasizes the views expressed by Chicago exporters that if the New York road would reduce their rates the area of territory tributary to Chicago and thence to New York would be greatly enlarged, and thereby the Gulf competition that has injured Chicago as well as New York would be successfully met."

Many more instances might be given, but this is put forward to show that the all-rail rate is the factor that dominates the whole of the transportation from these trade centres and immense trade areas, and that Chicago as a great trade distributing centre is vitally affected in cheap transportation. Cheap transportation alone can meet the competition of St. Louis, Kansas City and the Gulf route which draws traffic away from the territory tributary to Chicago, and the cheaper the transportation by way of the Lakes, the more its tributary area will be enlarged.

3

How do lakes effect rates?

The point we now have to consider is how, then, do the lakes affect this great struggle going on between the Atlantic and Gulf ports for this traffic?

The reply is that at present they simply afford a means by which the Eastern roads can maintain their hold over the largest share of this traffic as shown by the following table.

In 1898 and 1899 the following were the *wheat* exports from the principal Gulf and Atlantic ports, as given by the New York Commerce Commission:—

Atlantic Ports.	1898.	1899.
New-York, Boston, Philadelphia, Baltimore and Newport News,	89,336,938	49,302,745
Gulf Ports.		
New Orleans and Galveston,	24,083,820	26,038,593
Montreal,	8,989,669	9,852,125
Bushels,	122,410,427	85,193,471
Tons,	3,710,000	2,580,000

The use to which the navigation has hitherto been put in connection with this trade is to convey the grain to the nearest railway termini, especially Buffalo, from whence it is taken to the seaboard.

By Buffalo and rail, creates a modification in favour of Atlantic Ports during the season, the same Chicago firm write: "That this is so is shown by the fact that between 75% and 80% of grain received at Buffalo goes for export. This route is used for competing against the Gulf roads and the reason why so small a percentage from

Buffalo is used for Home consumption is that all through Indiana, Southern Illinois, Michigan, Ohio, Virginia and Pennsylvania rates are so adjusted that the interior and domestic trade can be supplied from these States to a great deal better advantage and at lower prices than if shipped from Lake Ports to Buffalo, Erie or Fairport and then distributed.

"The railroads east of Buffalo are all in a pool, and one man makes the rates for all the roads, giving each road so much business. The Erie Canal business is so small that they ignore it and let them take whatever they can. They figure in exactly the same way regarding Montreal. If the Montreal roads, or all-water routes can take business to the seaboard a little cheaper than via Buffalo, it is such a small proportion that they will let it go, being sure of the greatest part."

"The Montreal route, either water and rail or all-water, bulks comparatively small and has little influence in controlling the general rate. The all-water route is nearly as much out of date as the Erie Canal. It has to go over exactly the same distance from Chicago or Duluth as to Buffalo, and from that point it has to go through the delay of the Welland Canal, has to trans-ship at Kingston and so through the St. Lawrence Canals to Montreal."

As against Buffalo's 148,000,000 bushels of grain Montreal received 22,000,000 of bushels last year, and be it noted, that of those 22,000,000 the greatest portion was taken there by rail from Parry Sound and other Georgian Bay ports, there being, in fact, a notable decrease in all-water transport. From a steady average of 650,000 tons in 1896, 1897 and 1898,to 425,000 tons in 1899, in spite of a considerable improvement in the canal system.

Yet the economy of water transportation as compared to rail is so well established that it needs no discussion. It may, however, be seriously handicapped by circumstances, and in this case the outlet from the lakes affects the whole position.

4 Certain conditions necessary to cheap transportation.

We have seen that in the last decade a notable reduction in transportation rates had taken place both on railways and ships. The factors that have contributed to this are *size* and *time*. In the case of railways the trucks have been made to carry nearly three times the amount they used to do, and the more powerful engines take at least twice the trainload. On the lakes the sizes of the steamers have been increased so that instead of carrying up to a couple of thousand tons, they have increased their carrying capacity even up to 10,000 tons. This is the greatest factor in cheap transportation, and this is what the all-water route to Montreal is deprived of, owing to the size of its canals, and especially of its locks, and therefore puts it out of the running for present competition.

The only reason why the Canadian railways can not only compete but take away the traffic from the all-water route is because they can avail themselves of this great improvement in lake transportation. The economy affected by the use of large steamers enables them to cut the water transportation so low that there still remains something over worth their having.

This is the reason why Buffalo can continue successfully to compete with the present all-water route, and why this latter has failed to attract any of the large export traffic. The advance in cheap transportation both by water and rail has gone ahead a great deal faster than the canals could be deepened and the locks enlarged. Mr. George Y. Wisner, in a paper read before the American Society of Civil Engineers, last October, referring to the St. Lawrence navigation, writes:—

"The expectations relative to the volume of traffic that would be developed have not been realized and it is extremely improbable that the small type of steamer which can pass the locks will be able to compete with the large lake freight carriers even when handicapped with excessive transfer charges at Buffalo. The small freighters of the lakes must go out of business and make way for the more economical type of carriers.

LOOKING DOWN THE MATTAWA RIVER FROM FOOT OF TALON CHUTE
(Summit Section.)

MONTREAL, OTTAWA & GEORGIAN BAY CANAL.

"The decline of traffic in the Erie Canal since 1880 and the failure of the 14 foot Canadian Canals to divert commerce from the lake and rail lines indicates that a waterway of less depth than required for the passage of the best type of lake freighters cannot materially modify the transportation rates over existing routes.

"The St. Lawrence navigation will prove a failure only in so far as expecting it to divert traffic from the present lake and railroad lines, or to materially modify freight rates on such lines. These Canals are achievements that their projecters may well be proud of and in the future as in the past, will continue important factors in the transportation of Canadian products and manufactures which are almost certain to largely increase in the near future." That this is so is shewn by the fact that traffic to the extent of 1,274,292 tons passed through the Welland Canal in 1897.

There are limits to this expansion in size of freighters both for the railways and the lakes and in both cases they have about been reached. The Chicago firm write: "There is, however, a limit to what the railways will carry for, either to the Gulf or to the Atlantic Ports, which appears to be about 9 cents per hundred pounds. At that rate they would rather not have it as it does not pay them. At 10 cents per hundred pounds, which equals 5.60 cents per bushel of corn and 6 cents per bushel of wheat, they will still take it but not very readily and only because of the keen competition."

Before the New York Commerce Commission the statement contained in the annual report of the Chesapeake and Ohio Railway Company for 1899 was put in evidence as follows:—

"The through rate was less while the through business decreased, it having been the policy of the Company during the last year not to solicit certain through business upon which the rates had been reduced to a figure at which it was not profitable to carry it when the cars could not be loaded back. For instance, during the past twelve months as compared with the previous twelve months there was a decrease of 7,965,543 bushels of grain carried to Newport News."

To the increase in size of the lake steamers there is also a limit, and this is the depth of water in certain parts of the lakes, such as the Ste. Marie river and the St. Clair flats and lake, besides the entrances to the several lake ports. This depth is practically 20 feet, the depth on the sills of the Sault Ste. Marie locks being 20 feet 3 inches and 21 feet. This point will be referred to again later on when considering the proper dimensions of locks and channels in the Montreal, Ottawa and Georgian Bay Navigation.

Taking the low rate to the seaboard from the Western ports such as Chicago, Duluth or Fort William at 4½ cents a bushel, we have the rates as follows:—

To Buffalo,	1¼ cents.	
Leaving from Buffalo to Atlantic ports,	3¼ "	
		4½ cents.
To Parry Sound,	1 cent.	
From Parry Sound to Coteau,	2½ "	
Coteau to Montreal,	1 "	
		4½ cents.

By the all-water route as at present worked:—

To Kingston,	3 cents.	
Kingston to Montreal,	1½ "	
		4½ cents.

It will be seen that the railway rates from Buffalo to Atlantic ports, 3¼ cents, and from Parry Sound to Coteau, 2½ cents, are not what traffic managers would call very remunerative.

The rate by the all-water route might no doubt be somewhat reduced by ½ a cent or even ¾ cents by having large steamers running to Port Colborne and special steamers and barges for the 14-foot navigation thence to Montreal. This, however, means discarding the present plant and the construction of a new and special fleet, which would probably absorb the saving for a long time to come. Besides, there is no saving in time, so that it hardly commends itself as a business proposition.

Mr. Thomas Munro, M. Inst., C.E., on this subject writes: "The fleet that can navigate the St. Lawrence to the greatest advantage has yet to be built." But will it pay to build?—and if not, can it ever be built?

The facts therefore justify the conclusion *that any waterway which does not admit of steamers passing direct between lake ports and the seaboard is not likely to prove a successful competitor of the railroads, and that any material reduction in transportation rates can only be obtained by constructing waterways on which quick trips can be made and all necessary transfer and termtnal chargcs eliminated.*

We also have three fundamental and controlling elements of advantage in the deep waterway laid down by Mr. Sweet, M. Am. Soc., C.E.:

(1st) The elementary physical law, that the resistence to motion in vessels of like model varies directly as their immersed surfaces while their tonnage varies as the cubic contents of their immersed section, ensures enormous economy in large boats:

(2nd) The obvious and controlling advantage of passing from terminal to terminal without transfer of cargo:

(3rd) A large fleet adapted to the navigation of the deep waterway already exists while to put the smaller canals into operation a new marine equipment must be created for which there could be little use elsewhere.

Mr. Henry Hunter, M. Inst. C.E., Chief Engineer of the Manchester Ship Canal, after referring to the necessity of improved transportation owing to the rapid increase of population and production, says: "If this were admitted and its significance realized proposals for the construction of barge canals or even ship canals of insignificant depths between the Atlantic seaboard and the lakes which form the natural centre of one of the greatest food producing districts on the earth, would drop into the limbo of "lost causes"; the insufficiency of either one or the other would become so manifest."

Transfer charges are only the smaller part of the total cost incurred on account of such transfer. *Transfer* versus *Transit* means all the difference between slow and inefficient service and quick, safe and reliable service at such low cost as to be beyond the reach of railway competition either in quality of service or price for the same.

The conditions for cheap transportation exist on the lakes to railway termini only and to Port Colborne, but not beyond. That is why the water route can make no impression on the traffic but is on the contrary losing it.

5
Need for a ship canal long Considered.

We have seen that a canal to achieve this object has not only been contemplated but worked at and elaborated for years in the United States where large sums have been spent in surveys and reports.

The final recommendation for a ship canal was to construct a 21 foot canal at Niagara Falls and starting from the St. Lawrence some fifty miles from Montreal to construct a canal thence to Lake Champlain through Canadian territory at a cost of over $192,000,000, with an alternative route from Oswego entailing a considerable greater cost.

In considering the lake connection with the sea, they could not overlook the self-evident claims of the Georgian Bay Ottawa Navigation and refer to it as follows:

"The Ottawa route is a short, independent line which may have great value for future development bnt its consideration is not now justified.

(*a* It is the shortest through route between terminals and is unquestionably adapted to a navigation of considerable capacity.

(*b*) For a large portion of its length it runs through a region meagre in resources, and the ice season is considerably longer than on the Lake Erie route.*

(*c*) The function of the Ottawa route is as a future loopline (?) for through business when traffic conditions shall have been sufficiently developed by the Erie Ontario route ; provided it shall be found capable of radical solution."

This is the utmost recognition one could possibly expect from across the border. One has only to consider if this highway of nature had been in the hands of the United States, how different the report and its conclusions would have read.

6
Proposed Canal.

The proposed Canal, or rather Navigation, goes from Georgian Bay into French River, Lake Nipissing and some smaller lakes into the Mattawa, thence into the Ottawa River and so past the Dominion Capital to Montreal. Its length is 430 miles. It rises from Lake Huron to Nipissing 60 feet and falls thence to Montreal 621 feet.

From previous considerations it is clear that a canal of a less depth than will allow of the best type of lake freighter to pass from the lakes to the sea would be of little use in influencing traffic.

In the report of the Department of Railways and Canals just issued the remarks on the Sault St. Marie are instructive. It says :—

"There are any number of vessels loading down to 18 feet 6 inches, and in one case to 18 feet 10 inches.

"The day of the large and deep draft vessels is to hand, there being now some 78 of the 500 feet class with 52 feet beam."

We have seen that the investigating Board of the United States reports against a greater depth than 21 feet.

The limit in size of economical Lake ship construction has evidently been reached, and even with unlimited depth it will not pay to construct freight carriers for Lake service alone any larger than the present size recently attained. The facts are, that with a haul of less than a thousand miles the running expenses and fixed charges for ships over 480 feet long, 52 feet wide and 19 feet draft increases more rapidly than the profits from increase of carrying capacity.

The only reason for constructing waterways more than 21 feet deep would be to accommodate foreign commerce between Lakes and foreign ports. The only saving to be obtained by a deeper waterway would be the cost of transfer or lighterage at seaboard, and for the bulk of the traffic the 19 feet carriers would be more economical.

It is therefore proposed to have locks 500 feet long, 60 feet wide, and 20 feet on the sill. They would be single locks, and would be so placed that at some future time they can be duplicated.

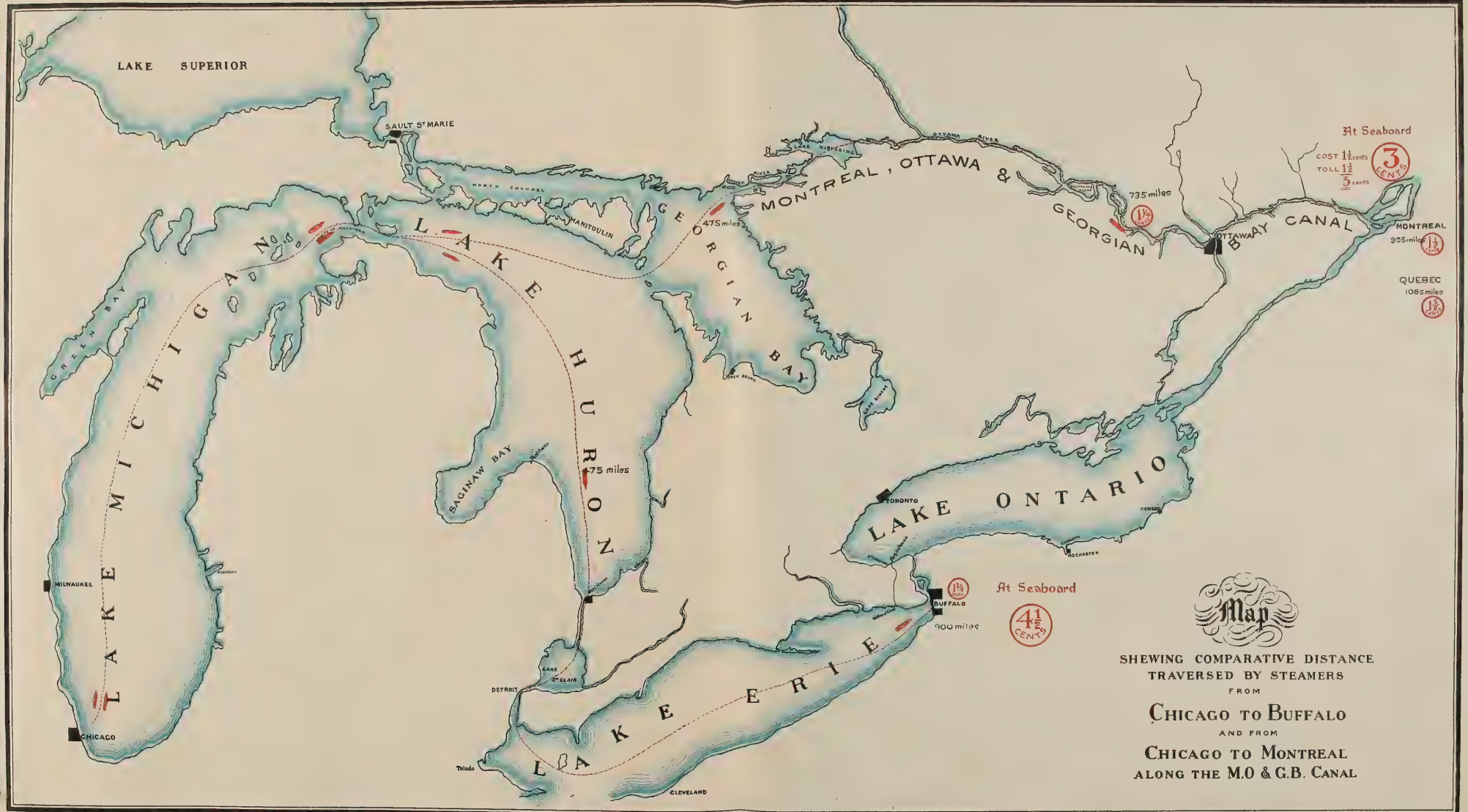
Such a canal as proposed will take any steamer or barge that can be made to profitably navigate the lakes right down to the seaboard without any transfer or obstruction, there to transfer direct into Ocean Steamers.

7
Advantage of such a canal.

The enormous advantage of such a canal is evident by **a glance at the map.** Supposing two steamers of the largest class to leave Chicago, they will run together till a little past Sault Ste. Marie or the Strait of Mackinaw. They then part company, one going to Buffalo and the other to Montreal via Georgian Bay. The distance between Chicago and Buffalo is 900 miles ; between Chicago and French River 475 miles, so that when the one ship arrives at the entrance to navigation the other has still 425 miles to its destination. Allowing for detention at 34 locks, we find that the vessel on its way to Montreal will have got to within 50 miles of Ottawa and 170 miles of Montreal when the other has arrived at Buffalo.

This means that for the same expenditure of time and cost required for one ship to reach Buffalo the other will nearly reach Ottawa. Assuming the rate to Buffalo to be 1¼ cents per bushel, the cost to near Ottawa will be 1¼ cents also. For the re-

*See last page.


LAKE SUPERIOR
SAULT St MARIE
NORTH CHANNEL
MANITOULIN
LAKE NIPISSING
OTTAWA RIVER
MONTREAL, OTTAWA & GEORGIAN BAY CANAL
735 miles
475 miles
At Seaboard
COST 1½ cents
TOLL 1½ cents
3 CENTS
MONTREAL
905 miles
1½ CENTS
QUEBEC
1085 miles
1½ CENTS
GEORGIAN BAY
LAKE HURON
LAKE MICHIGAN
GREEN BAY
MILWAUKEE
CHICAGO
SAGINAW BAY
475 miles
DETROIT
LAKE St CLAIR
Toledo
CLEVELAND
LAKE ERIE
LAKE ONTARIO
TORONTO
ROCHESTER
BUFFALO
900 miles
1¼ CENTS
At Seaboard
4½ CENTS
Map
SHEWING COMPARATIVE DISTANCE
TRAVERSED BY STEAMERS
FROM
CHICAGO TO BUFFALO
AND FROM
CHICAGO TO MONTREAL
ALONG THE M.O & G.B. CANAL

maining 170 miles and 16 locks to reach Montreal, or 24 hours, ¼ of a cent will be ample addition.

The grain, therefore, can be delivered at Montreal, exclusive of course of any toll, for 1½ cents, *and it is not possible to question such a conclusion.*

From Buffalo to the seaboard at least 3¼ cents have to be added, and therefore grain can be delivered at the seaboard at Montreal for 3 cents less than it can be taken to the Atlantic ports of the United States. That is to say, for one-third the present cost.

This of course is the immense difference which exists between a transit route and one in which transfer is required. No new ships will be required to obtain the best advantage from this route but those that will do so are already built, or will be in anticipation of its completion.

If a 20 foot navigation were now made through the Welland and the St. Lawrence, the cost would be not less for it has the same number of locks and 77 miles of canal as against 32 or the Ottawa route, and it would still be at a great disadvantage as regards distance and time. From Port Colborne to Montreal the distance is the same as that from the mouth of French River to Montreal, but of two ships starting from Western Ports one would be at Montreal before the other was half-way through the Welland canal; still 400 miles from its destination. This means loss of time and increase in cost.

8 **Further advantages.**

Besides this, such a canal as proposed with locks of this size will take any steamer on the ocean except the largest liners. This has reference principally to what are known as "ocean tramps," which have come into being since the opening of the Suez Canal, and draw some 24 feet of water. Such ships are only freighters; their length does not exceed 450 feet. Tney would lighten at Montreal or Quebec to pass through the canal, and after their trip to lake ports would again fill up at Montreal or Quebec, so as to load down to their proper depth for crossing the ocean. This is a very important advantage. First, it prevents the lake tonnage being limited, as should the demands of an unusually large transportation require more tonnage, such would be introduced; and secondly, it would enable the large and valuable lake steamers to be employed outside when the lake navigation is closed, thus releasing an enormous capital, which is now locked up for profitable use in trading, along the Atlantic coast.

The cost of internal transportation in the United States being about twenty times as much as that for the foreign trade, a large part of the traffic of this navigation will probably be between lake ports and the Atlantic coast harbours of the United States.

9 **Comparison with other canals.**

The natural advantages of this route are very great when compared with those of similar undertakings. One of the great disadvantages of a canal route is the reduced speed at which steamers have to pass through it. This is necessitated by the wash created by steamers going at great speed, inflicting damage to the artificial banks. The narrowness of the channel also prevents steamers passing each other under way and regulations have to be made by which one or the other stops to let the other go by, and special passing places have in most cases to be constructed for the purpose. The speed at which steamers pass through the Suez, North Sea, Baltic Sea and Manchester Ship Canals is about 6 miles an hour, though on the latter the limit of speed has been increased from 6 to 8 miles.

When there is a great length of artificial canal this reduction of speed becomes an important item, and in the proposed ship canal to New York the width at bottom was made 215 feet wide, for the special purpose of overcoming the stoppages and making it possible for ships to pass each other under way. On this navigation the only real standard canal would consist, besides the Lachine Canal, of about 24 miles; 6 miles at the Grenville Canal, with ¾ miles of the Carillon Canal and a

LOOKING UP THE OTTAWA RIVER FROM A POINT SIX MILES EAST OF MATTAWA.

portion of the summit level. Out of 55 miles of summit level, however, 43 are deep water lakes, and of the 12 miles remaining the greatest single length of cutting between lakes is only 4¼ miles. Besides this, the whole of this portion is in rock-cutting and therefore no damage to the sides can be caused by the wash, and though steamers could not pass each other under way at these short lengths, they could go through at their full speed.

Comparing the longest length of artificial canal of 6 miles with the continuous 90 miles of the Suez Canal, the natural advantage of these deep water channels are very evident. The locks practically become the only hindrances to free navigation and it is clear that so advantageous is this navigation that though from lock to lock it will have a length of 430 miles yet of the canal proper, by which is meant such conditions as will retard the speed and cause the stoppage of steamers, it has only an aggregate length of 32 miles and that in practice the disadvantages inherent to an artificial canal hardly exist at all.

On the other hand the whole length is a protected deep water channel having the advantage over Lake navigation that it is not exposed to storms and ships cannot be delayed thereby.

Such a canal would, therefore, have the full advantage which *size* and *time*, the great factors in cheap transportation, can possibly give.

10 **Probable tonnage.**

Now we come to the important part, of tonnage and revenue. Revenue will be derived chiefly from the export and import trade. The export trade in grain alone from the districts dependent on lake navigation amounted in 1898 and 1899 to the following, as given in the Chicago Board of Trade Report :

Tons.	1898.	1899.
Flour,	1,534,994	1,848,569
Wheat,	4,941,042	4,225,237
Corn,	6,958,160	5,802,966
Oats,	1,115,004	490,480
Rye,	578,032	338,028
Barley,	267,550	53,986
Total tons,	15,334,782	12,759,266

We know from our former considerations that about two-thirds of this total goes from Chicago and lake ports to Atlantic ports chiefly by Buffalo, but a great deal of it by all rail. And we also know that a slight reduction in the rate will greatly increase this proportion by drawing away this traffic from Gulf ports. Considering the difference at which this traffic can be brought to the seaboard by the Ottawa navigation, we should be able to count on the greater part of the two-thirds, but let us take only one-half.

This would amount to from 7½ to 6½ million tons, and taking two-thirds of this as moved during the lake season, would give from 5 to 4½ million tons to come by the navigation.

That this deduction gives too low an estimate is shown by the 1899 report of the Committee on Canals of New York State, which shows that the grain and mill products from western lake ports to Lake Erie ports and Montreal amounted to 8,714,390 tons in 1898.

We can get another check by taking the grain exported from Buffalo. Last year that amounted to over 120,000,000 bushels, or over 3½ million tons, and adding the million that already goes to Montreal, gives a tonnage of 4,500,000 tons in grain alone, besides what goes from Fairport and Erie.

Taking it from another point of view, and considering the traffic which passes through the Soo, we find that last year it amounted to 25,643,000 tons. Of this

grain, eastward bound, amounted to 2,560,604 tons, nearly the whole of which would be for export, and is bound to come through the canal. To this has to be added what comes from Chicago and Milwaukee, amounting to 3,500,000 tons, and further than that of other lake ports, such as Milwaukee.

We therefore see that as a minimum traffic from grain alone cannot be less than 5,000,000 tons, at a low estimate.

Copper ores figure for a large amount and probably at the present time 100,000 tons of the same would take the canal.

Some iron ores, which bulk to over 16,000,000 tons at the Soo, would also pass through the canal. The United States Commission refer to is as follows :

"A few years ago agricultural products and lumber made the cargo of lake shipping but the discovery of iron ore in the Lake Superior region is bringing about far-reaching economic changes, which favourable conditions of transportation will develop in a manner which can hardly be estimated.

The Spanish ore deposits with an output of 6,000,000 tons annually are rapidly being exhausted. With deepwater access to the Ocean the iron ores of Lake Superior will take their place."

If this was taken into account by the circuitous route round all the lakes which adds 400 miles and along a canal 685 miles long how much more is it likely to pass through a chord line of a total of 430 miles to the seaboard ; and this demand is in millions !

We know that a large iron industry is being successfully begun at Sydney. They are able to make basic steel, but for the purpose of making bessemer steel it is said they will require the ores of Lake Superior. Ships taking the ore from Lake Superior will have a return freight of coal and this brings us to another question, the probable traffic in coal.

Nova Scotia coal has hitherto not ascended the St. Lawrence to any extent above Montreal, to which point the shipments amount to 700,000 tons. The expense and loss incident to trans-shipment and the competition of American coal have prevented any further extension of the market for Canadian coal in this direction. A glance at the map, however, will show that the Ottawa waterway will give the Canadian coal a great advantage in competing with American coal. All the Lake Huron and Georgian Bay ports are closer to Montreal by four hundred miles by the Ottawa than by the St. Lawrence. The portion of Ontario stretching all the way from the Quebec boundary to the Manitoba boundary, including the richest mineral district of the province, will be served by the canal. Going up the St. Lawrence, Canadian coal directly meets the American competition. Every mile travelled west is a mile into the territory of American coal shippers, but a journey of 400 miles up the Ottawa brings the coal carrier within a few miles of Sudbury, to the edge of possibly the greatest mineral area in Eastern Canada, and 200 miles more brings him to the "Soo." There is also no reason why grain should not be taken from Fort William to Sydney. It could be stored there and shipped all the year round ; would be a thousand miles closer to Liverpool than it would be at New York, and the vessel could be sure of a return freight of coal.

11 Other sources of traffic.

There are other sources from which traffic is sure to come. The export from the United States in 1899 of beef, hog products, cheese and butter, amounted to 1,574,000 tons, of which the bulk originated at Chicago and the district to the west of the Great Lakes. This is high-class freight which has to be carefully handled, and there can be no doubt that special steamers would be built for the purposes of this trade, and that the cool, northern route through the Ottawa and the St. Lawrence will be of great advant-

age. This question of heat is a great drawback to the Gulf route, and the coolness of the Ottawa route would greatly help to draw traffic that way.

The lumber industry of the Ottawa district represents in pine alone an annual freight of not less than 2,000,000 tons of sawn lumber. Under present conditions all except what is carried through the Ottawa and Champlain canals has to be hauled by rail, the rail charges on lumber from Western Ontario to Montreal being heavy. The opening of this waterway would mean cheap transportation, and open to the lumber trade of the Ottawa Valley the important market of the Great Lakes region. The importance of that market may be judged from the fact that nine lake ports alone received in 1896 over 2,270,000 tons of sawn lumber.

Cheap transportation will render merchantable from the whole of this district vast quantities of birch, maple, hemlock, tamarac, ash, oak, elm, etc., and rough lumber, which under present conditions cannot be moved, and which will find a ready market in the country about and west of the Great Lakes.

The total amount of cordwood transported is nearly ¼ as great as the freight of all other kinds of lumber together. The output, without any increased cut of pine, will probably not fall short of 5,000,000 tons yearly, the bulk of which will be moved by the Navigation.

Large quantities of pulpwood are already shipped by rail from Lake Nipissing, and the district is a shipping point for probably 2,000,000 cords of standing spruce suitable for pulpwood.

Mills in operation or course of construction at Sault Ste. Marie and elsewhere have a daily capacity of over 500 tons of pulp, which will before long increase to over 1,000 tons. This is chiefly for export, and the reduction in the cost and possibility of direct shipment will result in an immensely increased production, which in time will reach 1,000,000 tons per annum, and would mostly pass through the canal.

With regard to iron. The output of iron ore from Lake Superior was, in 1900, 16,000,000 tons, and has literally created the enormous shipping and shipbuilding industries of the Great Lakes, has built up the iron and steel industry of the United States, and has a far-reaching effect upon many branches of manufacture and upon commerce generally. It has created a large export trade from the Pittsburg and Lake Erie District.

So important has this become that a canal is contemplated from near Conneaut to Pittsburg, for the purpose of saving the cost of trans-shipment and the rail transportation from Conneaut to Pittsburg, amounting to about $1 per ton. The transportation, by rail, of the finished articles from Pittsburg to Philadelphia or New York, costs $2.90 per ton. There is no doubt that once this canal is constructed it will be used, not only for the purpose of bringing the raw material to Pittsburg, but also for exporting the finished article by the cheapest and direct route through the canal to its destination.

12
Through shipments already contemplated.

Even with the present canal having a limited draft and restricted lock accommodation, direct shipments are contemplated from Chicago, not only to Liverpool, but also to Rio de Janeiro. It is a notable fact that the steamers now being constructed for lake and ocean commerce through the existing Canadian canals are for 20 foot draft, it being considered more economical by the builders to lighter through the canals than to undertake transportation on the lakes with ships of only 14 feet draft.

If this is the case when special vessels have to be constructed, on what a different scale would this be done if a canal was constructed open not only to any ship that can float on the lakes but also to merchant steamers on the high seas when lightened at Montreal or Quebec? and does it not illustrate the great need of a shipping outlet from the Lakes?

LOOK NG UP OTTAWA RIVER FROM HEAD OF DEUX RIVIERES RAPIDS.

MONTREAL, OTTAWA & GEORGIAN BAY CANAL.

13
Additional revenue from water power.

It is well known that a large amount of power can be obtained along this waterway. It will have to be harnessed at all the locks for the purpose of working them by electricity. It would then be advantageous so to build the locks and dams as to make it possible to exploit the power for industrial purposes as well as for the use of the canal. If exploited in a business-like manner the revenue from this source should be considerable ; and properly worked, it may be possible, in a few years' time, to get the required revenue from this source alone and thus reduce the toll to a nominal figure.

Mr. Bell, M. Inst. C.E.. writes concerning this water power :—" It has been estimated that the water power on this canal system will aggregate many millions of horse power so distributed as to provide the nucleus of several manufacturing towns of great importance.

" The power available at the different points in many cases exceeds that of several works of the same nature on which very large amounts have been spent in the United States.

" The cost of rendering the water powers available commercially either for direct water power or for the conversion into electrical energy will be in most cases extremely moderate, and the many uses to which it can be put considering the resources of the country adjacent to the canal, render the utilization of the water powers second only in importance to the canal itself."

Also :—

" The enormous resources of timber and minerals along the route of the Georgian Bay and Montreal Canal, and of the country tributary to it, as well as the volume of raw products which will pass through it capable of conversion en route, render it a foregone conclusion that the lucrative possibilities of that immense water power supply can scarcely be overestimated."

14
Estimate of traffic.

When one comes to make an estimate of the probable traffic it is difficult to arrive at a reasonable figure. It must be borne in mind that the figures just given are the actual ones at this time. That the canal, if begun to-day, will take five years to construct, and who can tell what the figures will be in five years' time?

Looking at the record of traffic at the "Soo" we find that the increase of tonnage between 1890 and 1895 was just 100 per cent. ; between 1895 and 1900, 70 per cent., and who shall say that in 1905 it will not again be at least 50 per cent. of this enormous total?

It is also impossible to make a detailed estimate of the probable traffic. If anybody had made an estimate twenty years ago of the probable traffic of the inter-lake channels he would have either greatly underestimated it or been laughed at as a visionary. The idea that iron ore in any quantity would be transported to Pittsburg from Lake Superior would have been thought utterly ridiculous. We now know from experience on the lakes that a great reduction in the cost of transportation will develop an enormous amount of new business, and that it will deflect from distant and more expensive routes business already existing. The development of new business is a relatively slow process while the deflection of existing business from other means of transportation will take place much more quickly. The experience on the lakes shows two things: First, that the new business developed by the lowering of freight rates is more than half the total ; second, that one cannot estimate in detail the new business which will be developed by a great reduction in cost of transportation.

One can, with some approximation, estimate the amount of existing transportation which will be transferred from other lines to one very much cheaper, but not the

new transportation which will be created. It is evident that the proposed ship canal will obtain most of the grain and much of the provisions passing from Upper Lake ports to Europe and the Atlantic Coast. It will obtain lumber in large quantities in both directions, besides iron ore, coal, etc. But to put definite quantities behind all these items is almost impossible.

The only way is to confine oneself to actualities. If one allows oneself to deal with probabiiities one might be greatly misled.

The estimate of traffic for the New York Ship Canal made by the U. S. commission of 1897 was 12,600,000 tons of grain alone, and adding ore, coal, lumber, salt, etc., 20,000,000 tons was taken as a low estimate! It was insisted on that the Canal should be capable of dealing with 38,000,000, tons and that provision should be made for duplicating the locks as soon as necessary.

The most conservative estimate on present actual figures that can be taken by any reasonable person is 7,000,000 tons of traffic, the bulk of which would be Eastbound.

In reference to this estimate the following letters speak for themselves :—

CHICAGO, ILL., March 11th, 1901.

ERNEST E. SAWYER, M.A., M. Inst. C.E.
Montreal, P. Q.

DEAR SIR :—

Referring to your favor of the 2nd inst , enclosing request for our opinion as to the effect on rates and commerce, both sea trade and local, if water-way were constructed from Georgian Bay to the mouth of the French River, through Lake Nipissing and Ottawa to Montreal, we would say that in our opinion it would really not affect the rates now existing to any great extent for a few years, but the gradual tendency would be to reduce the charges now prevailing.

The rates at present via the all-rail routes from the west to the seaboard, as well as the water routes from the west to the seaboard, *are about as low as the business can profitably be carried.* Therefore, an all-water route through the channel spoken of, with a large saving in mileage, would mean that the new canal would practically receive all the business it could handle for the next several years at nearly present rates. We mean by this within ⅛c. or ¼c. per bushel of what is now paid.

Of course the volume of business which would be sent via the new canal would largely depend upon the amount of ocean tonnage at Quebec or Montreal. If this were increased, which would probably be the case if a large additional lot of grain were put into those ports from the west, instead of going to the American seaboard ports, business or the amount of stuff handled would be limited only to the facilities of the canal terminals and ocean tonnage.

The route proposed would certainly be the shortest and cheapest of any now existing for the transportation of grain from the west to the seaboard.

Your truly,
(Signed) ARMOUR & Co.

OTTAWA, March 23rd, 1901.

MESSRS. ARMOUR,
Chicago.

MY DEAR SIRS :—

In the last part of the second paragraph of your letter of the 11th inst. you say the canal should "handle for the next several years at nearly present rates."

I do not quite follow your meaning. Assuming that grain could be taken by the

LOOKING UP THE OTTAWA RIVER BETWEEN DEUX RIVIERES RAPIDS AND MATTAWA.

MONTREAL, OTTAWA & GEORGIAN BAY CANAL.

navigation and delivered at Montreal, including tolls, for three cents, the present seaboard rate from Chicago being, say, 5 cents, do you mean that the rate would only drop in practice to 4¾ cents?

Increased facilities and amount of ocean tonnage at Quebec and Montreal is also assumed, and would undoubtedly be provided in good time.

Yours truly,

(Signed) E. E. SAWYER.

CHICAGO, ILL., March 25th, 1901.

E. E. SAWYER, Esq., M.A., M. Inst. C.E.
Victoria Chambers,
Ottawa, Can.

DEAR SIR:—

We have your favor of the 23rd inst., and note carefully your remarks.

You are right in assuming that we think the new route would only have to drop their rate ⅛ to ¼ cent below present rates, in order to obtain a good share of the business, and any such rate as that you quote—3 cents per bushel from Chicago to Montreal—would throw just as much business via that route as it could possibly handle, the all-rail lines via Buffalo not being able to compete with any such figure. Of course, this would be with the understanding that ocean rates from Quebec to Montreal would remain on the same parity as they now are, compared with New York and Boston.

Yours truly,

(Signed) ARMOUR GRAIN COMPANY.

It should be noted, however, that all this applies to low class freight which cannot bear a high rate for transportation, and which can only be developed by cheap water transport. An increased demand for a higher class of freight will be created by the business which must inevitably follow the construction of a great water-way, and will more than compensate the railways for the loss of the low class traffic. High class freight is package freight, not readily handled by mechanical devices, and therefore not likely to go by water.

15 **Surveys.**

The surveys and plans on which the estimates are made, though taken at various times, are both complete and exceedingly well done.

An exploration was made by Mr. Walter Shanly, M. Inst. C.E., of the whole route from Georgian Bay to Montreal, in 1856. Actual surveys were also made by him from Lake Nipissing to the Junction of the Mattawa River with the Ottawa, and also from Fort William, on the Upper Alumette Lake, to the head of the Deschenes Rapids, near Ottawa. Upon these Mr. Shanly based his report and estimate of 1858. There are also the plans and surveys of the Ottawa River, made for the Geological Survey.

The whole length of the waterway has thus been sounded, surveyed and is known.

It consists of 367 miles of natural deep-water navigation, that is, below 22 feet; and the heavy work is confined to two sections. One is the summit level, a distance of 25 miles; the other the Ottawa River channel, along Alumette and Calumette Islands, a distance of about 30 miles.

LOOKING UP LOWER HALF OF MCCONNELL'S LAKE.

Mr. T. C. Clarke, M. Inst. C. E., made surveys for all the lock sites, from the Georgian Bay to Ste. Anne, as well as of the reaches from the mouth of the Mattawa River to Chats River. His report and estimate are based upon these surveys, and information obtained from the Geological Survey and Mr. Shanly's plans and report, and he proposes 50 locks.

Mr. E. P. Bender, M. Inst. C. E., made a survey and reported upon the portion of the route from Georgian Bay to Lake Nipissing in 1879, with plans of the river stretches and lock sites.

In 1899, a survey was made by Mr. Henry Macleod, M. Inst. C. E., with much care, of the Summit Section, from Lake Nipissing to Talon Lake, on the Upper Mattawa River, and borings were made throughout to ascertain the nature of the material to be excavated.

The principal object of this survey was to ascertain the feasibility and cost of getting an ample water supply by means of cuttings connecting Lake Nipissing with Talon Lake, as the quantity that can be obtained from the sources of the Mattawa River is much too small. Large scale plans and estimates were made of this section.

In 1900, Mr. Macleod made an approximate estimate of the cost of the whole line, from the Georgian Bay to Lake St. Louis, making the navigation 14 feet on the lock sills and 16 feet in the open reaches, with locks 250 feet by 45 feet. This estimate was based upon Mr. Clarke's report and plans. The level of the water stretches was very little changed, but the locks were set lower, and the prism of the canal deepened.

In 1899–1900, Mr. Macleod made surveys and estimates for the Department of Railways and Canals, from Deschenes Lake to Ste. Anne, including the locks at Deschenes and Chaudière Falls at Ottawa, but omitting the Grenville to Carillon canal, of which the Department of Railways and Canals possesses all the necessary information.

In the autumn of 1900 Mr. Macleod commenced surveys of the Rocher Fendu Channel, and the Calumette Channel, on each side of the Alumette Island. This comprises the most difficult portion of the Ottawa River, and it was made for the purpose of ascertaining which channel is the best and most economical. Plans and estimates of this portion have lately been completed,

There are profiles and cross sections of the Lock sites, as made by Mr. Clarke, also plans and most of the profiles of all the reaches, made by Messrs. Clarke, Shanly, Bender and Macleod. Also Bender's plans of the Lock sites and River stretches of French River from Georgian Bay to Lake Nipissing.

All Mr. Macleod's surveys agree very closely with those made in former years.

16 **Cost of construction.**

The estimated cost of construction of the 20 foot waterway based on the plans and surveys is $68,000,000. This may, however, be modified by financial and other contingencies.

17 **Possible reductions and additions.**

Reductions will no doubt be possible, but on the other hand, additions may be necessary. For instance, at the Grenville Canal, there are five locks with a combined fall of 52 feet and the Carillon Canal with a maximum fall of 17 feet has two locks. In the estimate the number of locks is maintained. For the new waterway the Grenville locks would probably be reduced to two, and the Carillon to one, thus making a considerable saving in the cost. There are three or four pairs of locks in the estimate which, on careful consideration, may possibly be treated in the same way, causing a reduction in the estimate and a great advantage to the navigation.

On the other hand, there are several curves on the present alignment of the canal which will have to be eased and straightened out.

Mr. Wisner kindly spent two days here looking over all the plans and information. He has since written the following:—

(*Copy*)

DETROIT, MICH., April 1st, 1901.

ERNEST E. SAWYER, Esq., M.A., M. Inst. C.E.
Ottawa, Canada.

DEAR SIR :—

In compliance with your request of March 26th, I have examined the plans, profiles and data for developing deep water navigation from Georgian Bay to Montreal, via French and Ottawa Rivers, and beg to say that they are ample for determining whether the project is worthy of being undertaken, and that estimates for 20-foot navigation can be made from the data you now have with the same accuracy as for 14-foot navigation.

Your estimate of 6,000,000 tons traffic is a low one. It will require about five years to construct the waterway, and by the time it is completed, vessels will be fully prepared to make use of it, and in my opinion, the average annual traffic for the first ten years after completion will not fall below 8,000,000 tons.

Your general conclusions as to the cost of delivering grain at Montreal are correct, and the results of opening the navigation by the French and Ottawa Rivers, should be as stated in the letters of Messrs. Armour of March 11th and 25th.

In case you wish further information with regard to any special feature of the project, I shall be pleased to answer any questions you may wish to submit.

Yours truly,

(Signed) GEO. Y. WISNER,
Consulting Engineer.

18
Cost compared with other canals.

This cost of $68,000,000 compares well with $192,000,000, the estimated cost of the New York Ship Canal, which is far longer both as a canal and in length of route, or the cost of the Suez Canal, over $120,000,000, also the recent estimate only just published, of the proposed New York Canal to be built by the New York State, of $75,000,000 for a barge canal of 12 feet only.

This Ottawa Valley Ship Navigation gives the **shortest route** to the seaboard for the **smallest amount** of money, and therefore gives the **most profitable** result.

19
Will it pay?

We now come to the all-important question, "Will it pay?"

While it would no doubt be a cause of great pride to all concerned in such a grand achievement as that of extending the navigation of the Great Lakes to the seaboard, yet any sentiment must be eliminated and any decision must be based upon deliberate conclusions drawn from actual facts. It must be clear that the result from direct reduction of rates and from resulting development of new commerce and industries will shew a balance on the right side and will in itself be remunerative.

We have seen that the minimum tonnage anyone can reasonably estimate for is 7,000,000 tons.

The saving over the present transport cost from lake ports to the seaboard at Montreal we found to be 3 cents a bushel, or $1 per ton. There is no necessity, and it is not proposed, to give the whole of this large saving to the trade. To begin with, it is proposed to share it. Later on, when the tonnage is greater, to gradually reduce the tolls. Besides the reduction of 1½ cents, or one-third the present minimum rate, the trade obtains the enormous advantages of **Time** and **Transit** without **Transfer.** It should here be noted that a reduction of ⅛ cent per bushel begins to draw traffic, and ¼ cent decisively so, and that we have six-quarters to the good.

We therefore have a toll of 1½ cents per bushel, or 50 cents per ton. This is no doubt very moderate and compares well with the 7*s.* 6*d.* per ton levied on the tonnage passing through the Suez Canal.

Looking Down the Ottawa River at a Point About Half-way Between the Deux Rivieres Rapids & Rocher Captain's Rapid

Montreal, Ottawa & Georgian Bay Canal.

This tonnage is estimated for traffic in one direction. There will be an equal tonnage of ships in the opposite direction, though they will not be fully loaded.

It will be a matter of detail as to whether this toll should be levied in one direction only when it would be 50 cents and the vessel allowed to return free of toll, or charged both ways when it would be 25 cents. No doubt sea-going steamers coming through to the lakes and going out again would be charged tolls both ways at 50 cents. But for the purposes of calculation it is better to confine ourselves to the 7,000,000 tons and to a toll on the same of 50 cents.

This gives us a revenue of **$3,500,000.**

20 **Working and Maintenance.**

From this amount has to be deducted the cost of working and of maintenance. With regard to the latter the fact of the navigation in its heaviest portion at the summit level having to be mostly cut out of rock is of great advantage, for the maintenance of such portion will be nil. The portions where the largest items for maintenance will occur will probably be at the entrance into the canal from Lake Nipissing, the stretches along Alumette and Calumette Islands and a small length below Ottawa. An estimate of $700,000 for the working and maintenance should be ample, leaving us a clear revenue of $2,800,000.

21 **Result, 4%**

Our cost for a 20 foot canal amounted to $68,000,000 and our net revenue to $2,500,000. So that the proposition works out to just over 4% on the expenditure with a certainty of future expansion of the traffic, and making a liberal allowance for working and maintenance, Allowing 3% for $65,000,000 Bonds requiring $1,950,000 leaves a balance to the good of $850,000.

A deep-water outlet from the Lakes is almost certain to be built on some route in the near future. With the fact definitely established that a waterway of proper dimensions was sure of construction within reasonable time by the Georgian Bay-Ottawa route it unquestionably would not pay to build a second canal on any other route. It is therefore good policy to settle on what is to be done at as early a date as possible.

22 **How it would effect other proposed ship canals.**

If this ship navigation is constructed the results will be far reaching. No other canal will be or ever can be constructed from the Lakes to New York. The cost of over $200,000,000 which is by some considered prohibitive now would become absolutely so because it would be unnecessary, and though it might be shewn to give a return now without any other ship canal to compete, the long loop canal would have no chance of competing against the short chord. The Ottawa Navigation would be in working order 5 years before the other could be completed if commenced at the same time.

The immediate result would, however, be the construction of the Montreal-Lake Champlain-Hudson route, which costing $60,000,000 less, would add largely to the traffic and revenue of the Ottawa Navigation.

The volume of traffic would then embrace that for domestic use on the Atlantic Coast as well as for export. With a New York connection the Ottawa-Georgian Bay Navigation should obtain practically the same amount of *through* traffic that was expected over a canal via Lakes Erie and Ontario. and the Mohawk River, and this was estimated at 20.000,000 tons.

The United States Deep Water Commission state the following: "The Champlain Hudson route, from Montreal to Lake Champlain, and from the head of Lake Champlain at Whitehall to Tide water on the Hudson at Troy sixty-four miles, *is the logical extension of a future Ottawa route* should conditions favour a radical development on that line, and it skirts New England."

This would take all the business intended for the Atlantic Coast, and it would probably be found that even the Gulf Coast could be supplied more economically by such a ship canal from the Lakes without transfer than by the Mississippi Valley or by rail.

This route to New York from Western ports, say Chicago, via the canal proposed

by the United States Commission, would be about 1625 miles in length, and via Ottawa Navigation and Montreal-Champlain Canal under 1350 miles, a difference in favour of the chord route of over 200 miles.

On the other hand, it must be borne in mind that if this waterway is neglected and a ship canal constructed through the United States, the chances of Canada obtaining any increase of export trade is not only gone, but the little she now secures will be taken from her.

The ship canal, once constructed and in operation, the Dominion of Canada by the St. Lawrence for seven months in the year will become the gateway for the whole of the export and import trade of the richest and largest part of the North American continent this side of the Rocky Mountains.

23 **Financial margin.**

Attention must be drawn to what may be called the financial margin of the undertaking.

The modest estimate of traffic will allow of a profitable capital expenditure far higher than the estimated cost.

Supposing the estimate of traffic should at once be exceeded by 1,000,000 tons, which is not improbable, there would be an additional net income of $500,000. This represents the interest at 3% on $16,500,000 and means that such increase justifies an additional capital expenditure of over $16,000,000 or nearly ¼ of the estimate cost of the Canal should it be needed.

This fact goes far to stamp the undertaking as a sound business proposition.

From the foregoing facts the following conclusions are inevitable.

FIRST.—That the great need of the enormous and rapidly increasing Lake traffic is an outlet for lake freighters to the Seaboard.

SECOND.—That such an outlet can be given by a 20 foot navigation only.

THIRD.—That the chain of rivers and lakes from Georgian Bay to Montreal is the natural waterway designed by nature to attain this purpose and by which Manitoba and the Canadian North West will be brought into direct, cheap, water communication with the Seaboard.

FOURTH.—That it is the shortest outlet by over 400 miles for the Western Lake Ports, and can be constructed at a cost of less than a third of any ship canal from the lakes to the United States Seaboard.

FIFTH.—That when constructed it will revolutionize the trade of the Great Lakes, diverting it to the ocean through the St. Lawrence to the benefit of the whole Dominion and specially of the ports of Montreal and Quebec and of the Maritime Provinces.

SIXTH.—That such a waterway with its waterpowers would open up to settlements and centres of industry the Provinces of Ontario and Quebec along the Ottawa Valley and French River.

SEVENTH.—That the opportune moment for entering upon and carrying to a speedy completion this important undertaking has arrived and deserves the material and energetic support of the Dominion Government.

*Lake Nipissing, the most Northern part of the Ottawa Navigation is 20 miles South of the "Soo." This season it was open a fortnight before the "Soo" and more than 3 weeks earlier than the Ste. Clair flats and Detroit channel, which were blocked with ice till the 10th of May.

The opening of this Navigation would place the Canadian lake fleet on the same advantageous footing as that at present enjoyed by the United States lake fleet. The former would be able to carry from United States Western lake ports to Montreal and Quebec, but the latter could not do so from any Canadian lake port. This would ensure every bushel of Canadian wheat being carried in a Canadian bottom.